

ANNEX 1

A possible method for non-GSO MSS coordination

A possible method for pfd coordination is described below:

The approach uses three steps for establishing the pfd sharing limit.

Step 1 - pfd coordination trigger (independent of system characteristics)

A pfd trigger is established to use as a basis for coordination which would be applicable to 1 - 3 GHz downlink allocations which could be used by non-GSO MSS systems. This pfd level should be [higher] than that in RR 2566. The level could be based on the model for sharing which was recommended by Working Party 9D. The levels for different bands are in the preliminary draft Recommendation in Annex 2 and are based on the range of values in Table 1.

If a non-GSO MSS system could meet this level, then coordination would not be necessary.

Step 2 - System operational pfd level

Under this proposed three-step approach, multiple coordinations and administrative burdens would be avoided by providing a basis for the Radiocommunication Bureau (BR) to make a technical examination analogous to an Appendix 29 examination on the need to have a detailed coordination with every administration with fixed systems. This examination would use recommended Radiocommunication Study Group methods to determine if the interference protection for terrestrial systems such as that indicated in Recommendation 758 (digital) and Recommendation 357 (analogue) is met. This would be carried out by taking into account the operational pfd characteristics of individual MSS systems. In general this approach could be applied using the Working Party 9D model analysis for evaluating the effect of non-GSO MSS on the fixed service. The system operational pfd would be different for each system concerned. Each system would be evaluated on the basis of its impact on the assumptions used in the previously mentioned 9D model. The BR would confirm compliance with the appropriate ITU-R Recommendations and that the operational pfd for the system does not exceed the required terrestrial system protection levels mentioned above. This would be accomplished through technical analyses provided by the administration proposing the non-GSO MSS system at the time of submitting ITU-R Appendix 3 information. This information would be published in the Weekly Circular. Provided that such technical analyses were confirmed the non-GSO MSS system would be permitted to use the operational pfd.

Step 3 - Administration coordination

If the fixed service system protection levels are exceeded in step 2 the administration with the proposed non-GSO MSS system would need to coordinate with all affected administrations.

ANNEX 2

PRELIMINARY DRAFT NEW RECOMMENDATION

**Criteria for coordination and sharing between the mobile-satellite
(space to earth) non-GSO systems and the fixed
service in the 1 - 3 GHz frequency range**

considering

- a) that Resolution Nos. 46, 113, 703, and 717 (WARC-92) invite the CCIR to study criteria for sharing and coordination between systems in the mobile-satellite service and the fixed and mobile services;
- b) that the bands [2 170 - 2 200 MHz, 2 483.5 - 2 500 MHz and 2 500 - 2 535 MHz] are allocated to the mobile-satellite (space-to-earth) service and fixed service on a co-primary basis;
- c) that the bands [1 492 - 1 525 MHz, 1 525 - 1 530 MHz and 2 160 - 2 170 MHz] are allocated to the mobile-satellite (space-to-earth) service and terrestrial services in some regions or by some administrations, on a co-primary basis;
- d) that in certain bands that are subject to the coordination procedures of Resolution No. 46 (WARC-92), WARC-92 adopted and applied the power-flux density (pfd) levels of RR 2566 as a coordination trigger for protection of receiving stations in the fixed service from transmitting space stations in the mobile-satellite service;
- e) that in order to fulfill basic operating requirements, mobile-satellite systems designed for operation in the 1 - 3 GHz range must generate pfd levels in excess of the levels specified in RR 2566;
- f) that a number of administrations have plans to operate mobile-satellite systems in many of the frequency bands in the 1 - 3 GHz range that are allocated to the mobile-satellite service;
- g) that WARC-92 created [...] MHz of new allocations in the 1 - 3 GHz range for the mobile-satellite service in order to help meet the rapidly growing spectrum requirements of that service;
- h) that for several decades, systems in the fixed service have been operated by many administrations in the bands newly allocated to the mobile-satellite service,

recommends

- 1 that in the band [1 492 - 1 530 MHz], the following pfd levels at angles of arrivals δ (in degrees) from non-geostationary space stations in the mobile-satellite service shall be applied as a coordination trigger:

[-158, -147] dBW/m ² /4 kHz,	for $0^\circ < \delta < 5^\circ$
[-158, -147] + r^* ($\delta - 5$) dBW/m ² /4 kHz,	for $5^\circ < \delta < 25^\circ$
[-144, -135] dBW/m ² /4 kHz,	for $25^\circ < \delta < 90^\circ$

- 2 that in the band [2 160 - 2 200 MHz], the following pfd levels at angles of arrivals δ (in degrees) from non-geostationary space stations in the mobile-satellite service shall be applied as a coordination trigger:

* r = rate at pfd reduction with decreasing angle of arrival.

$[-158, -147] \text{ dBW/m}^2/4 \text{ kHz},$	for $0^\circ < \delta < 5^\circ$
$[-158, -147] + r (\delta - 5) \text{ dBW/m}^2/4 \text{ kHz},$	for $5^\circ < \delta < 25^\circ$
$[-142, -133] \text{ dBW/m}^2/4 \text{ kHz},$	for $25^\circ < \delta < 90^\circ$

3 that in the band [2 483.5 - 2 535 MHz] the following pfd levels at angles of arrivals δ (in degrees) from non-geostationary space stations in the mobile-satellite service shall be applied as a coordination trigger:

$[-158, -147] \text{ dBW/m}^2/4 \text{ kHz},$	for $0^\circ < \delta < 5^\circ$
$[-158, -147] + r (\delta - 5) \text{ dBW/m}^2/4 \text{ kHz},$	for $5^\circ < \delta < 25^\circ$
$[-142, -128] \text{ dBW/m}^2/4 \text{ kHz},$	for $25^\circ < \delta < 90^\circ$

4 that if pfd trigger values specified in **recommends** 1, 2 and 3 are exceeded, the common ITU procedure for coordination described in Annex 1 of this Recommendation is to be applied.

* r = rate at pfd reduction with decreasing angle of arrival.

EXHIBIT B



INTERNATIONAL TELECOMMUNICATION UNION

RADIOCOMMUNICATION
STUDY GROUPS

Document 2-2/TEMP/3-E

3-February 1994

Original: English only

Chairman, Task Group 2/2

FORM OF RECOMMENDATIONS

This document is offered for discussion within TG 2/2. It summarizes the main points discussed during the first joint WG 2-WG 3 meeting on 2 February 1994 concerning the form of Recommendations which TG 2/2 should develop. It also contains the personal views of some participants, which are offered for consideration as a means of advancing our work and defining specific objectives for the Recommendations.

Annex 1 discusses interpretations of "trigger level" and "threshold" with respect to the Radio Regulations.

Discussion on alternative forms of Recommendations

Recommendations which set [hard limits] have the advantage of allowing a system designer to determine rapidly whether or not a planned system will be compatible, with respect to interference, with existing systems. Because of the wide range of system characteristics which may be used by different systems, the values chosen for the [hard limits] will in general be conservative, in order to ensure that there is only a small probability of harmful interference arising in practice. As a consequence, there will be many cases where a planned system may exceed the limits, but would not if implemented, cause or suffer harmful interference. In summary, [hard limits] are convenient to use and avoid coordination, but are potentially wasteful of the allocated spectrum.

By contrast, procedures which lead to coordination or other discussions between the administrations of affected services have the potential to maximize the use of the available allocation by the services sharing the band. The specific characteristics of planned and existing systems can be taken into account to optimize the sharing ability of the systems, for example by modifying some parameters of the planned system. A penalty, however, is the need to undertake complex coordination procedures with possibly many different administrations. Very substantial cost and time is involved. A further difficulty is that any changes to an existing system's parameters could result in the need for further coordination requirements.

Recommendations which are based on [soft limits or] threshold values could retain the advantages of [hard limits] for those planned systems with parameters which do not exceed the specified values. When the limits are exceeded, procedures could be invoked, perhaps with a series of levels of complexity depending on the amount by which the threshold values are exceeded. This approach would allow maximum spectrum utilization where necessary, at the possible price of complex coordination.

A question which arises in comparing the cases for [hard limit] and [soft limit] is the value of the limit in each case. Should a [hard limit] be more conservative (i.e. lower) than a soft limit, or conversely should the soft limit be lower? It could be argued that the limit is the same either way,

since the aim is to have as high a limit as possible without unreasonable risk of unexpected harmful interference. An unnecessarily low limit would unnecessarily exclude some systems ([hard limit] case) or invoke additional work ([soft limit] case). A counter view could be that the [soft limit] be lower, since the subsequent procedures would ensure that no systems were unnecessarily excluded. However, it is not clear what advantage would be gained from having a lower softer limit.

This discussion on the relative values of [hard] and [soft] limits implies that the same or comparable parameters be specified in each case. This, however, is not necessarily true e.g. [hard] limits may be e.i.r.p. and pfd values, while the [soft] threshold limit may be some measure of interference such as C/I or another performance degradation parameter.

The view was stated that while simple methods are desirable, ultimately pressures on spectrum may well force us to the more complex procedures.

From discussion in the joint WG 2-WG 3 meeting, it appeared that there was general support for some form of [soft limit]. Further, there was interest in the concept proposed in Doc. 2-2/29.

Assuming that TG 2/2 adopted Recommendations with [soft limits], there is then a need to develop the subsequent procedures for evaluating/resolving potential interference. Parts of these procedures are beyond the scope of TG 2/2.

With the restructuring of the ITU the Radiocommunication Sector has ^{giving} taken on more ^{broader terms of reference} responsibility for the development of regulations, ~~checking the~~ Study Groups and ~~log reference~~. TG 2/2 has responsibility for developing technical and operational regulations. It is not fully clear where the responsibility lies for developing regulatory procedures. However, TG 2/2 could give guidance on what procedures need to be developed.

There was also brief discussion on the relative merits of a small number of general Recommendations, and a larger number of more specific Recommendations addressing specific bands and/or system types. It was noted that a more specific Recommendation was likely to lead to better spectrum sharing as it could more closely reflect specific system/frequency band requirements. There appeared to be some support from the meeting for this approach.

Some additional points for consideration by the meeting

- 1) It seems likely that the output of Task Group 2/2 will take the form of a number of Recommendations, each addressing a particular sharing scenario.
- 2) One or more of these Recommendations may contain a simple ~~decides~~ to the effect that the particular sharing scenario is not possible.
- 3) Other Recommendations may include either a simple trigger value or a table of such values. If the trigger value is exceeded then something further is required or suggested. Most probably the additional task would relate to coordination between administrations.
- 4) Generally, the calculation method associated with the trigger value should not require large databases, nor should it be complex. It must therefore be conservative in its estimate, giving the uncertainty in calculation to the benefit of the affected administrations.
- 5) It may be necessary to involve a third party, such as the BR, at this stage in order to provide independent calculation results and to undertake certain administrative duties.
- 6) In those cases in which the exceeding of the trigger value requires an administration to coordinate with one or more other administrations, it is necessary to stipulate precisely how this is done - to define the coordination procedures.

7) More often than not the coordination procedures will be in two distinct parts. One part will provide the necessary technical parameters and methods in order for administrations (and others) to conduct a detailed analysis of the particular sharing scenario - to remove the "uncertainty" mentioned earlier. It is clearly essential that the parameters and methods are acceptable to all parties - this is the essence of technical procedures. Such procedures are (clearly) within the competence of the BR.

8) On the other hand, there is a need for regulatory procedures. These may, for example, contain the detailed instructions for the BR to undertake calculations and to subsequently communicate their findings to administrations. Such procedures will most probably contain dates and/or times. Their production is almost certainly beyond the mandate of Study Group 2. Equally, if Task Group 2/2 develops Recommendations which ultimately require regulatory procedures, then it has the responsibility of ensuring that the ITU/BR is aware of this need.

ANNEX 1

Discussion of interpretation of "trigger level" and "threshold" with respect to the Radio Regulations

Trigger level has been employed loosely in discussing new coordination approaches for radio services. For example the term trigger level is used in the Chairman's Report of the first meeting of Task Group 12/4. In this context trigger, trigger value or trigger level can be taken to mean a radio system parameter, that when exceeded outside a national boundary, invokes a predefined procedure. This procedure is typically a coordination involving the Radiocommunication Bureau.

The word threshold is loosely employed in the Radio Regulations and is a value associated with a predefined level of protection from interference (permissible interference). The terms threshold and trigger value could be used interchangeably in some cases. Interference thresholds may still need to be established to facilitate coordinations invoked by a trigger value. There may be triggers or triggering mechanisms for coordination procedures that are not technical parameters.

Hard limits and absolute values refer to system parameters contained in the Radio Regulations that cannot be exceeded for systems [entered in the master register]. Often, however, the Radio Regulations allow for system to operate in excess of these values under certain conditions or for systems that operate only within national boundaries.

Other limits may be defined to assist in coordinations.

Examples:

Invoking specific coordination procedures based on a trigger value:

RR 726 requires use of Resolution 46 procedures to bring into service non-GSO MSS systems for coordination with terrestrial services if the pfd exceeds the limits in No. 2566. Parts of Resolution 46 are also invoked in this case for GSO MSS systems as well. Similarly, RR 599A and 647B use the trigger value of a -125 dB (W/m²/4 kHz) to trigger Resolution 46 for coordination with terrestrial services. The use of Resolution 46 procedures between space stations is triggered by specification in Article 8 and not by a technical parameter.

Use of a threshold to invoke a coordination:

Appendix 29 defines a threshold for interference of a six per cent increase in noise as a "trigger" for further satellite-to-satellite coordination.

Hard limits or absolute values:

ITU-R Recommendations 358, 359, 406 (see Annex 4 to Doc. 12/4-34):

Note - Recommendation 406 defines several levels some of which may be exceeded under some circumstances.

In addition the Radio Regulations typically allow for "absolute values" to be exceeded if agreement can be reached with affected administrations.

Other types of limits:

ITU-R Recommendation 647 (see Annex 4 to Doc. 12/4-34) defines a threshold pfd limit to determine the "affected administrations" under Article 14 procedure. In this case this pfd is not a trigger level since Article 14 must be followed regardless of the pfd employed, nor is it an absolute limit as stated in the note to this Recommendation.



INTERNATIONAL TELECOMMUNICATION UNION

RADIOCOMMUNICATION
STUDY GROUPS

Addendum 1 to
Document 2-2/TEMP/3-E
7 February 1994
Original: English Only

Chairman, Task Group 2/2

ANNEX 2

[Hard] x [Soft] limit approach - some personal views from the Radiocommunication Bureau

On the basis of the experience in the application of the Radio regulations the following comments are provided aiming at adding another dimension to the discussion going on in TG 2/2.

The **[hard limit]**, in theory, introduces an "additional right" in the form of a protection against interference enjoyed by the possibly affected service, in such way that between the two services (space and terrestrial) that share the frequency band, presumably with equal rights, one is "more equal" than the other. In practice, the possibly affected service takes little if no advantages from this situation and the main reason for that is the lack of specific procedures (except in ART14) to duly treat aspects related to the space station into terrestrial station interference aspects. The publications by the BR of the AP3 data of a satellite network is normally seen by the administrations and even by the BR itself as a space-to-space coordination procedure and the space-to-terrestrial interactions are not adequately covered by those procedures. On one hand, no clear mechanisms exists for facilitating agreements that could be obtained for a pfd excess (penalizing the space service) and on the other hand, a simple statement by the administration responsible by the space station of its undertaking to take operational measures to reduce in practice the notified power to comply with the pfd requirement is enough to avoid an unfavorable finding in the notice examination (possibly penalizing the terrestrial service). Therefore, the **[hard limit]** approach, yet facilitating space system designs and theoretically protecting the terrestrial services, has the disadvantages of harming the notion of sharing on the basis of equal rights, introducing inefficiency in the spectrum utilization (if the limit is conservative), not providing clear mechanisms for agreements to be reached; giving room to arbitrary interpretation of the limit compliance.

The **[soft limit]**, acting as a coordination trigger and applied in association with adequate operational and regulatory procedures, seems to provide the best compromise for the full enjoyment of the equal rights status of the two services concerned. This would require minimum involvement of the BR in examination/findings exercises and leave to administrations/operators the task of taking the necessary measures to utilize the spectrum for their best, with the inherent risks of deadlocks if mutual cooperation will not exist.

CERTIFICATE OF SERVICE

I, William D. Wallace, hereby certify that I have on this 30th day of March, 1994, caused copies of the foregoing Petition for Clarification and Partial Reconsideration to be served via hand delivery (indicated with *) or by U.S. mail, postage-prepaid, to the following:

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